THE ASYMMETRIC EFFECTS OF FISCAL POLICY SHOCKS ON PRIVATE CONSUMPTION IN SAUDI ARABIA

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Abstract

The objective of this paper is to examine the asymmetric effects of exogenous fiscal policy shocks on the level and grow rate of private consumption is Saudi Arabia during the period 1973-2011. In this respect, fiscal policy variables are disaggregated into government capital and current expenditures, and the associated innovations are decomposed into expansionary (positive) and contractionary (negative) shocks. Both models agree on the following conclusions. First, expansionary government capital and current expenditures stimulate private consumption and lift up the optimism level of private agents. Second, negative shocks tend to be larger in magnitude than positive ones, indicating that private consumption is not flexible enough to vary symmetrically with fiscal policy. In case of contractionary shocks, the results are mixed. With regards to the first model with level specifications, the empirical evidence supports the presence of asymmetric and crowing in effects of fiscal shocks. On the other hand, the second model agrees in a temporary fashion with the neoclassical view and ecrowding-out effects.

Keywords: Asymmetric Shocks, fiscal policy, private consumption, SVAR

1. Introduction

The motivation of this study is to find out how fiscal policy decisions can affect private sector variations. Specifically, it investigates the existence of the asymmetric effects of expansionary and contractionary exogenous fiscal policy shocks on private consumption in the Saudi economy. Choosing the Saudi economy as a case study comes from the fact that government spending, through development plans, is the driving force behind most of economic activities. Moreover, the heavy dependence on oil combined with instability and uncertainty in the international oil market have made the domestic economy more vulnerable to exogenous shocks which may

complicates macroeconomic development and fiscal sustainability. It is, thus, plausible to focus on the effectiveness of fiscal policy as a tool to accommodate and stabilize cyclical fluctuations in private consumption given that the Saudi monetary policy is passive due to fixed exchange rate regime.

The empirical approach relies on a structural VAR model with level and difference estimations. In particular, identifications of fiscal policy shocks are based on contemporaneous Cholesky factorizations and structural long-term procedures. Applying two methodological schemes would help to capture more information and determine whether the fiscal effects are transitory or permanent. Technically speaking, in both models fiscal policy variables are disaggregated to government capital and current expenditures, and their associated shocks are decomposed into expansionary (positive) and contractionary (negative) shocks.

The research acknowledges the challenge of linking fiscal policy decisions to promote private sector activities. This challenge emerges from the fact that there are wide disagreements and divergence of opinions among economic schools with such connection. The standard Keynesian theory prefers persistent fiscal policy shocks to temporary, and it predicts that an increase in government spending leads to higher aggregate demand, which in turn increases income and stimulates private consumption. This mechanism is known as the crowding-in effect. On the other hand, the neoclassical models stress the fact that a rise in government expenditure has a negative wealth effect on private sector activities because of the expectation that government consumption may crowd out private consumption.

The absence of conclusive findings in both theoretical and empirical studies regarding this issue has prompted this paper to search for evidence of how exactly private consumption behaves in the face of government expenditures fluctuations during good and bad times.

The results indicate that both models are not mutually exclusive as they agree on the following: expansionary government expenditures stimulate private consumption and lift up the optimism level of private agents which comes in line with the Keynesian model, and negative shocks tend to be larger in magnitude than positive ones.

The structure of the paper is organized as follows. Section 2 provides a literature review, followed by a section that describes the econometric methodology. Section 4 provides a detailed description of the data in use. The main results are reported in section 5, while section 6 concludes.

2.   Literature Review

The empirical literature on the interaction between fiscal policy variables and macroeconomic activities apply various methodologies,

including cross-section and panel models; general equilibrium models; and VAR-based models. Unfortunately, the empirical findings of these models have failed to provide robust conclusions. The main objective of most of these studies is to find an answer to whether fiscal policy has Keynesian or non-Keynesian effects on economic activity. The Keynesian view indicates that a fiscal policy expansion positively affects current income, and consequently increases private consumption even in the long term. On the other hand, the neoclassical school emphasizes that a fiscal policy expansion has no impact on output due to the Ricardian equivalences, but it may cause a crowding out effect and consequently decrease private consumption.

With regards to studies that are in favour of the Keynesian effects of fiscal shocks, Blanchard and Perotti (2002) analyse the response of output to fiscal policy shocks in the post-war period in the United States. They use a mixed structural VAR/Event approach where identification is achieved by using institutional information about tax and transfer systems. They conclude that positive government shocks have a positive effect on consumption, whereas positive tax shocks have a negative effect. On the other hand, private investment was consistently crowded out by taxation, and crowded in by government spending. Fatas and Mihov (2001) provide an empirical investigation of the effects of the macroeconomic fiscal policy shocks in the US economy. They compare such effects implied by standard general equilibrium models with the empirical results from structural VAR. The study concludes that positive shocks in government spending are followed by strong and persistent increases in consumption and employment. Similarly, Gali et al. (2004) show that a persistent expansion in government spending generates an increase in household consumption, which comes in line with the prediction of the Keynesian model. They find that the responses of different macroeconomic variables to an exogenous spending shock will depend, under some conditions, on the composition and timing of the taxation.

On the other side of literature, there are many studies support the non-Keynesian effects of fiscal policy. Most noticeably, Giavazzi and Pagano (1996) examine the size and persistence of fiscal budget changes on private consumption. They provide some empirical evidence on how contractions and expansions in fiscal policy can have non-Keynesian effects if there are sufficiently large and persistent. Similarly, the existence of non-Keynesian effects on private consumption has been found in McDemott and Westcott (1996), Zaghini (2001), Afonso (2006), and Giudice et al. (2007).

For the purpose of determining the optimal identification method this, we shall shed some light on VAR-based studies. Generally speaking, these studies are classified according to their restriction schemes. There are four main categories: studies that apply dummy variables to account for any

exogenous development in fiscal policy (Ramey & Shapiro, 1992); studies that apply institutional information of fiscal system (Blanchard & Perotti, 2002); studies that benefit from recursive structure (Kamps & Caldara, 2006); and studies that employ sign restrictions (Mountford & Uhlig, 2002). However, it is important to point out that there has been a clear divergence of opinions in these studies on the optimal identification approach to analyse the effectiveness of fiscal policy. Since we are interested in comparing the size and persistence of fiscal policy shocks on private consumption during expansions and contractions, it seems plausible to take advantage of both contemporaneous and long-term recursive structures.

The importance of this research comes from the fact that it investigates the link between private consumption and fiscal policy in an economy with distinguished characteristics, such as the Saudi economy where government is a major player in determining and directing overall macroeconomic activities. To my knowledge, no previous study has investigated the dynamic effects of disaggregated government expenditures on private consumption for the Saudi economy while allowing for the underlying shocks to vary asymmetrically across the boom-bust cycles.

It is expected that the outcomes of this research would elucidate the channels through which fiscal policy actions could leak to the private sector. Knowing such channels would be insightful for policymakers to quantify and maximize the desired effects of fiscal policy decisions on the behaviour of private sector.

3. Econometric Methodology

As previously mentioned, this study uses two alternative methods of identification of the structural errors. The first method deals with the contemporaneous impacts of the underlying shocks by applying recursive ordering namely Cholesky decompositions. This approach estimates VARs in levels and uses the inverse of the Cholesky factor of the residual covariance matrix in order to obtain the impulses. The second approach applies structural long-term restrictions where all variables transformed to growth rates, and the impulses obtained from using the orthogonal transformation of the structural factorization matrix. Despite the controversy of choosing between level or growth rate specifications, estimating both models could be more useful for comparison purposes. According to Sims, Stock, and Watson (1990) transforming models to stationary is in many cases unnecessary which makes the level specification eligible to preserve some important information contained in the raw data.

Before proceeding with the methodology, it is important to determine the ordering of the variables in the VAR models. In the literature, it is usually common to assume that fiscal policy variables can be treated as

exogenous with respect to the state of the economy, see for example Ramey and Shapiro (1998); and Blanchard and Perotti (2002). Thus, throughout this study government expenditure variables will be treated as exogenous which implies that private consumption has no contemporaneous or long-term effects on government expenditures.

With regards to methodology, one can start with the following general mathematical representation of a two-variable VAR:

$$y_{1t} = \gamma_{10} - b_{12} y_{2t} + \gamma_{11} y_{1t-1} + \gamma_{12} y_{2t-1} + \varepsilon_{1t}$$
$$y_{2t} = \gamma_{20} - b_{21} y_{1t} + \gamma_{21} y_{1t-1} + \gamma_{22} y_{2t-1} + \varepsilon_{2t}$$

(1)

To be specific, y_{1t} consists of government expenditures (G_t) and y_{2t} represents private consumption (PC_t). In this study, G_t is disaggregated into government capital expenditure (CAG_t) and government current expenditures (CUG_t). By default, ε_{1t} captures the unexpected structural shocks to either of government expenditure that is uncorrelated with the unexpected structural shocks to the private consumption ε_{2t}.

The matrix formation of (1):

$$\begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix} \begin{bmatrix} y_{1t} \\ y_{2t} \end{bmatrix} = \begin{bmatrix} \gamma_{10} \\ \gamma_{20} \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix} \begin{bmatrix} y_{1t-1} \\ y_{2t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$

Or in compact form:

$$\mathbf{B} y_t = \gamma_0 + \Gamma_1 y_{t-1} + \varepsilon_t$$

(2)

where $y_t = [G_t, PC_t]$. The reduced form of the SVAR is obtained by multiplying (2) by $\mathbf{B}^{-1}$:

$$y_t = \mathbf{a_0} + \mathbf{A_1} y_{t-1} + \mathbf{u_t}$$

(3)

Since the structural shocks are unobservable, it is mandatory to invert the reduced form in (3) into a vector moving average form (VMA). To do so, Wold representation is used through multiplying both sides of (3) by $\mathbf{A}(L)^{-1}$:

$$y_t = \mu + \Psi(L) \mathbf{u_t}$$

(4)

where $\Psi(L) = \mathbf{A}(L)^{-1} = (\mathbf{I_2} - \mathbf{A_1} L)^{-1}$ and $\mu = (\mathbf{I_2} - \mathbf{A_1} L)^{-1} \mathbf{a_0}$

$\Psi(L)$ is a matrix that defines the contemporaneous structural relationship between the system shocks. Moreover, the structural moving average (SMA) representation of y_t is designed to describe the linear relationship between the structural shocks ε_t and the reduced form residuals u_t. Substituting $u_t = \mathbf{B}^{-1} \varepsilon_t$ into (4) yields:

$$y_t = \mu + \Psi(L) B^{-1} \varepsilon_t = \mu + \Theta(L) \varepsilon_t$$

(5)

where $\Theta(\mathbf{L}) = \Psi(L) \mathbf{B}^{-1}$

In order to identify the structural shocks to fiscal variables, it is essential to make a decision with respect to identification methods. The first

scheme is Cholesky factorization of $\mathbf{\varepsilon_t = Pu_t}$ where the reduced form covariance matrix is $\Omega = E\,(\mathbf{u_t u_t'})$. The Cholesky factorization of the positive semi-definite matrix Ω is given by:

$\mathbf{\Omega = PP'}$,

$$\mathbf{P} = \begin{bmatrix} p_{11} & 0 \\ p_{21} & p_{22} \end{bmatrix}$$

$\mathbf{P}$ is the inverse of the lower triangular Cholesky factor of the residual covariance matrix. In this SVAR model, identification of is completed through restriction on the parameters of the SMA representation (5). That is, the zero restriction is based on the assumption that private consumption shocks do not have contemporaneous impacts on the exogenous fiscal variables. Then, $\theta_{12}^{(0)} = 0$ and Θ_0 becomes lower triangular:

$$\Theta_0 = \begin{bmatrix} \theta_{11}^{(0)} & 0 \\ \theta_{21}^{(0)} & \theta_{22}^{(0)} \end{bmatrix}$$

Since $\Theta_0 = B^{-1}$, this suggest the restriction $b_{12} = 0$ is implied.

The second approach uses a structural VAR modelling with **I(1)** data that are not cointegrated. In this case, variables are transformed into growth rate which yields the following SVAR representation:

$$\mathbf{B}\Delta\mathbf{y}_t = \gamma_0 + \mathbf{\Gamma}_1\Delta\mathbf{y}_t + \varepsilon_t \tag{6}$$

and the reduced form VAR for Δy_t is:

$$\Delta\mathbf{y}_t = \mathbf{a_0} + \mathbf{A_1}\Delta\mathbf{y}_{t-1} + \mathbf{u_t} \tag{7}$$

Thus, the Wold MA representation of (7) is:

$$\Delta\mathbf{y}_t = \mathbf{\mu} + \mathbf{\Psi}(L)u_t \tag{8}$$

and the SMA representation is:

$$\Delta\mathbf{y_t} = \mathbf{\mu} + \mathbf{\Theta}(L)\mathbf{\varepsilon_t} \tag{9}$$

where $\mathbf{\Theta}(L) = \mathbf{\Psi}(L)\mathbf{B}^{-1}$.

From the equation $\mathbf{u_t} = \mathbf{B}^{-1}\varepsilon_t$, one can obtain the relationship between the long-term effects of the innovations, $\mathbf{\Psi}(1)$, and that of the shocks, $\mathbf{\Theta}(1)$:

$\mathbf{\Theta(1) = \Psi(1)B^{-1}}$.

The key restriction is that long-term movements in private consumption have no permanent impacts on government expenditures. In terms of the elements of the matrix $\mathbf{\Theta(1)}$, this restriction suggests that:

$$\Theta(1) = \begin{bmatrix} \theta_{11}(1) & 0 \\ \theta_{21}(1) & \theta_{22}(1) \end{bmatrix}$$

Since both models are identified, it is a straightforward process to extract the impulse response functions for Cholesky and structural decompositions.

4. Data Analysis

This study uses annual data ranging from 1973-2011. The macroeconomic variables are government expenditures and private consumption, which are taken from yearly bulletins of the Saudi Arabian Monetary Agency (SAMA). These variables are transformed to real series by using the corresponding implicit deflators and expressed as shares of real GDP.

Following the national accounts, government expenditure in Saudi Arabia is disaggregated into two categories: current expenditure (consisting of consumption, subsidies and salaries for public sector); and capital expenditure (consisting of governmental sector fixed investments). Figure (1) shows the shares of current and capital expenditures to total government expenditures. It is safe to say that current expenditures constitute a large portion of total government expenditures throughout the study sample, with an average of 71% for the period 1973-2011 compared to 29% for capital expenditure. However, the shares of capital expenditure have taking a positive trend after 1991 by increasing gradually to reach 40% in 2011. This is partially due to the increasing pace of government investments especially in infrastructure projects.

Figure 1: Shares of Capital and Current Expenditures.
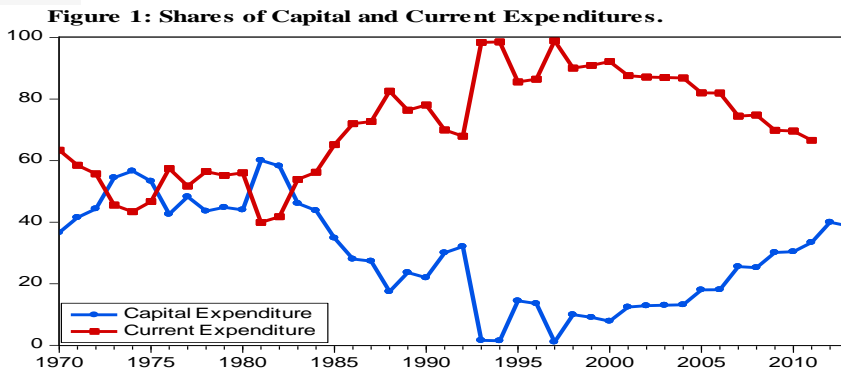
With regards to the technical calculations, I follow the method of Cover (1992) in order to calculate the unanticipated asymmetric fiscal policy shocks. The process involves extracting the residual series from the OLS equations of the disaggregated government expenditures against private consumption, and then identifying the positive (Pos_t) and negative (Neg_t) expenditure shocks. Formally, the positive and negative shocks are:

$$Pos_t = 0.5\left[|Shock_t| + Shock_t\right] \tag{10}$$

$$Neg_t = -0.5\left[|Shock_t| - Shock_t\right] \tag{11}$$

where $Shock_t$ represents the fiscal policy shocks obtained from the above mentioned OLS estimates.

For the data to be consistent with the long-term identification of the SVAR, the variables should be stationary i.e., $I(1)$. To test for the presence of unit roots, Augmented Dickey-Fuller (ADF), and Phillips-Perron (PP) tests are employed and the results displayed in table (1).

Table 1: Unit Root Tests.

	Level		1st Difference	
	ADF	PP	ADF	PP
CAG_t	-1.553	-1.660	-5.487	-5.428
CUG_t	-2.999	-2.907	-4.666	-5.888
PC_t	-2.189	-1.557	-4.955	-5.055

It can be observed that all variables are non-stationary in level. However, the null hypothesis of a unit root can be rejected for the three variables in first differences, which indicates that each variable depicts $I(1)$ behaviour. With variables having the same order of integration, it is important to investigate the existence of co-integration by applying the Johansen-Juselius trace and eigenvalue tests (λ_{trace} and λ_{max}). The results are shown in tables (2) and (3) for capital expenditure and current expenditure, respectively. Both trace and eigenvalues tests reject the cointegration relationships and, therefore, the long-term SVAR model can be estimated in first differences.

Table 2: Johansen-Juselius Cointegration Tests.

Panel A: Trace Test				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None	0.219294	10.00290	12.32090	0.1186
At most 1	0.002513	0.100639	4.129906	0.7942
Panel B: Max Eigenvalue Test				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.
None	0.219294	9.902257	11.22480	0.0847
At most 1	0.002513	0.100639	4.129906	0.7942

Table 3: Johansen-Juselius Cointegration Tests.

Panel A: Trace Test				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None	0.219294	10.00290	12.32090	0.1186
At most 1	0.002513	0.100639	4.129906	0.7942
Panel B: Max Eigenvalue Test				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.
None	None	0.057328	2.361458	11.22480
At most 1	At most 1	0.005120	0.205339	4.129906

5.   Empirical Results

This section discusses the results of the two models: the Cholesky identification model where variables estimated in levels; and the second model with long-term restrictions where variables expressed in first differences. For each model I extracted four exogenous shocks: the positive and negative capital expenditure shocks and the positive and negative current expenditure shocks. The impulse response functions (IRFs) of these external shocks help to analyze how efficiently the estimated SVAR models could evaluate the reaction of private consumption over time. The evaluation will be within the context of the Keynesian and neoclassical models. Needless to say, Keynesian models imply that private consumption increases after a positive shock because of the crowding in effects; and neoclassical school emphasizes that private consumption may decrease as a result of the crowing out effects.

Before discussing the results in terms of IRFs, it is important to mention that the optimal number of lags that ensures the absence of serial correlation of the residuals is two. With regards to the result, the IRFs of the first model can be depicted in figures (2) and (3). With respect to capital expenditure shocks (figure 2), one can detect some asymmetric effects. The initial response of private consumption to the contemporaneous expansionary capital shock is negative. Then, the impact increases gradually over time before it reaches its peak in the fifth year just before it diminishes slowly as time horizon expands. The asymmetry arises from the fact that private consumption follows similar patterns in the face of expansionary and contractionary shocks.

Figure 2: Responses of Private Consumption to Capital Expenditure Shocks
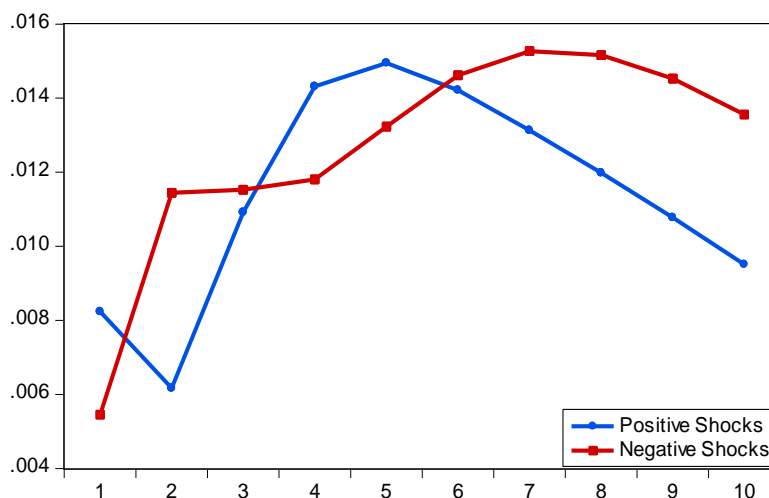
With respects to contemporaneous government current spending shocks (figure 3), the response of private consumption to the expansionary fiscal shock is in line with the Keynesian theory. In the beginning private agents respond negatively to the expansionary shocks indicating their concern about the crowding out effects associated with the expected increase in government consumption. Then, they adopt a new strategy by assuming that government intervention will benefit the economy through the wealth effect, generated from government transfer payments and subsidies, which raises optimism along with consumption in the period following the shocks. Meanwhile, the contemporaneous contractionary current expenditure shocks seem to be irrelevant in affecting the optimism level of private agents. In fact, these shocks perceived well as they stimulate private consumption providing an additional evidence of asymmetry.

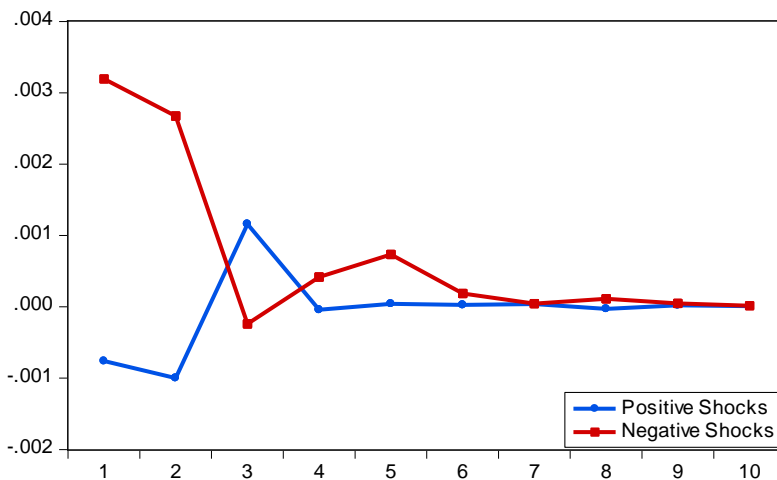**Figure 3: Responses of Private Consumption to Current Expenditure Shocks**
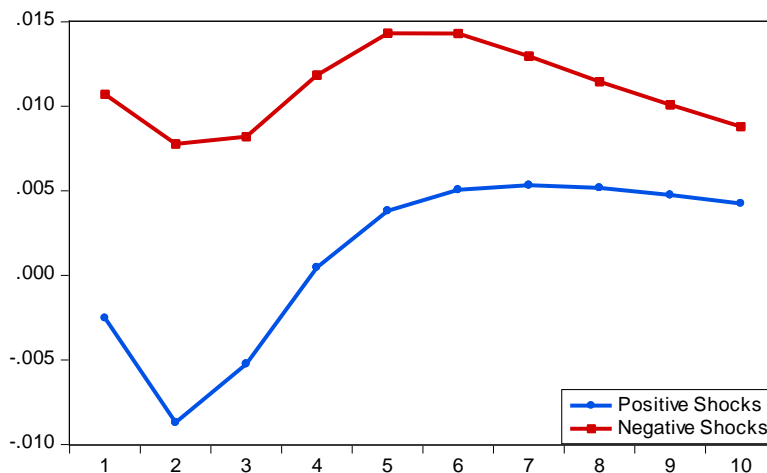
Comparing both figure (2) with figure (3) in terms of magnitude and duration yields the following:

1. Private consumption follows procyclical behaviour in response to contemporaneous expansionary shocks. Meanwhile, private agents act counter-cyclically in response to contractinary shocks.
2. It is likely that the expansionary and contractionary government shocks are perceived as permanent by private sector.
3. The asymmetric effects are captured in both figures.
4. Negative shocks tend to be larger than positive ones, indicating that private consumption is not flexible enough to vary with stabilization policy

With regards to the long-term SVAR approach, the outcomes of figures (4) and (5) carry out some interesting findings. As seen in figure (4), in the beginning the neoclassical prediction appears strongly in this model as private consumption decreases in response to the expansionary capital expenditure shocks. This attitude towards long-term expansionary shocks could be attributed to the fact that consumers may feel the pressure of being poorer as a result of a negative wealth effect and the possibility of more crowing-out effects. However, these effects are temporary in nature since they start to increase and then fade away with time before converging to long-term equilibrium.

On the other hand, the results reveal that private consumption follows procyclical path and decreases in the face of the long-term contractionary capital expenditure shocks, implying that private consumption is responsive to a stabilizing fiscal policy. Overall, it is safe to say that private consumption responds to both long-term expansionary and contractionary capital shocks symmetrically but in a temporarily fashion.

Figure 4: Responses of Private Consumption to Capital Expenditure Shocks

By the same token, figure (5) supports the fact that the responses of private consumption towards current expenditure shocks are similar to those of capital spending shocks, confirming the existence of both symmetric and crowing out effects.

Figure 5: Responses of Private Consumption to Current Expenditure Shocks
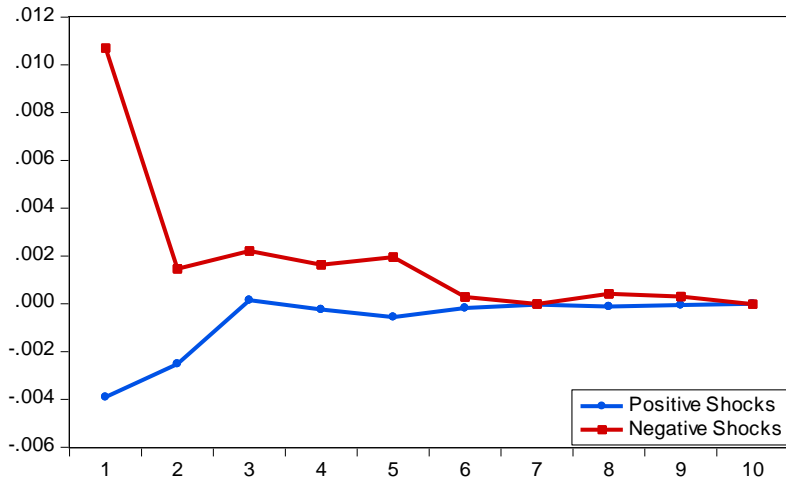
Comparing both figure (4) with figure (5) in terms of magnitude and duration yields the following:

1. Private consumption follows pro-cyclical behaviours in response to long-term positive and negative capital and current expenditures shocks.
2. It is possible that the expansionary and contractionary government shocks are perceived as transitory by private sector.
3. The symmetric effects are captured in both figures.
4. Negative shocks tend to be larger than positive ones.

All in all, the two models are not mutually exclusive as private consumption behaves similarly in the face of contemporaneous and long-term expansionary shocks. However, if one has to select one model based on statistical criterion such as Akaike Information Criterion (AIC), it seems that the first model with level estimation is preferred since it has lower AIC compares to that of the second model.

6. Conclusion

This paper investigates the asymmetric effects of the Saudi fiscal policy shocks on the level and growth rate of private consumption. Based on identifications, the study applies two alternative VAR models in order to capture the dynamic effects of contemporaneous and long-term shocks. The fiscal policy variables are disaggregated into government capital and current expenditures, and the associated innovations are decomposed into expansionary (positive) and contractionary (negative) shocks.

In the model with levels specification, the results detect asymmetry in the effects of government capital and current expenditure shocks. Private consumption increases in the face of both expansionary and contractionary shocks. The counter-cyclical fluctuations in private consumption in the face of contractionary contemporaneous shocks indicate a neutral role of fiscal policy in accommodating and stabilizing the private sector activities. It appears that private agents are more optimistic than pessimistic in receiving any government intervention which makes the sector less vulnerable to boom-bust cycles of fiscal policy. Overall, the evidence in this model supports the existence of crowding-in effects which is supported by the Keynesian hypothesis. Furthermore, it seems that accumulated capital expenditure shocks are larger in size than their current spending counterparts. The main explanation for this relationship is that governmental investments in projects are significant enough to stimulate private employment and directly raise the sector's marginal productivity.

In the second model with first difference specification, symmetry is detected and contractionary shocks appear to be more powerful in affecting private consumption compares to expansionary shocks. Nevertheless, these effects are temporary in nature as they fade away with time horizon. Overall, the evidence in this model supports the existence of crowding-out effects which matches the neoclassical view.

The policy implications are straightforward indicating that higher government expenditures will always stimulate private consumption and lift up the optimism level of private agents. Further extensions of this work could include other policy variables such as money supply to account for coordination between monetary and fiscal authorities in stabilizing and/or stabilizing private consumption. In addition, the study can be expanded geographically by conducting a similar approach for a group of countries with similar structure such as Gulf Cooperation Council (GCC).

Acknowledgement:

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